The Amazing Growing and Shrinking Antarctica

This is me on a German research vessel, the R.V. Polarstern, in the Weddell Sea, Antarctica. Every few years I work on sea ice and usually I do this from a ship that is especially equipped with an ice-breaking hull and on-board laboratories and space for computers. These 'cruises' are always exciting because groups of scientists interested in various things about the ice go out together and share results from their measurements. We always learn a lot when we work on the ice. My red suit is a special flotation suit so that if we fall overboard or through the ice we float and stay warm for at least long enough for someone to rescue us. I have thankfully not fallen in yet.

Hi, I'm Mark Drinkwater from the Jet Propulsion Laboratory in California. I work with David Long from Brigham Young University in the field of oceanography to understand how and why the sea-ice around Antarctica changes with seasons. Each winter, ice grows on top of the ocean around Antarctica because the cold air temperatures drop down below -30° C. This floating sheet of ice (around 1 meter thick) is important because the area of Antarctic ice is about as large as North America. Small changes in the extent of the ice make a big difference to the amount of fresh water in the ocean (by melting) and to the heat balance of the Earth (by reflecting the sun's rays).

During expeditions, I have worked on the sea ice that surrounds Antarctica, making measurements of snow and ice thickness and how salty the ice is. This tells us how old the ice is and and also helps us interpret satellite images. Actually I call myself a *polar oceanographer* because I work on frozen oceans in the far north and the south. Working in Antarctica is a good way for a Californian to cool off in the summer, but it is too far to go for a weekend! Normally we go there for a period of a month or more.

David and I are specialists in using satellite data from a radar instrument called a scatterometer. In 1996 we made a map of Antarctica [Fig. 1] from scatterometer data from a satellite. A *scatterometer* is an instrument that sends down pulses of radar energy, a bit like the detector that the police use for catching speeding cars. We get a lot of information from the energy that bounces back off the ice surface. This information is converted into a map showing the Antarctic land mass which is covered by glacial ice (formed from snow squished down over thousands of years). The coastline beneath the ice is indicated on the image by the black outline. The floating sea ice which grows all around the land in winter looks much grayer in the satellite picture, although if you stand on the ice it looks very white (as it is covered by snow). The black hole in the middle is missing data, where the satellite could not see. Watch the movie [Fig. 2] of how the sea ice changes over a year.

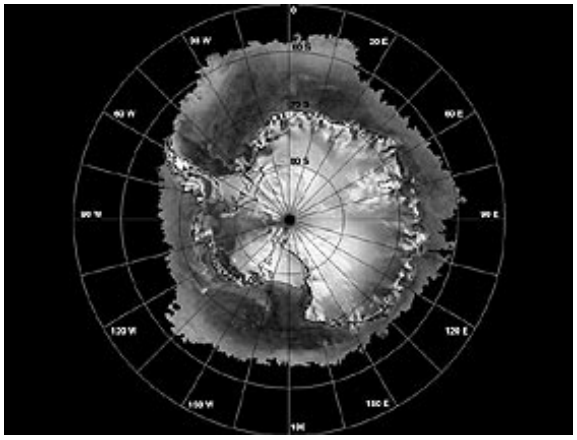


Figure 1. This is an upside-down bird's eye view of Antarctica. The south pole is right in the middle of this image (where we have no scatterometer data). The edge of Antarctica is shown with a black line, the white area inside the coast is land ice, and some areas have ice several miles thick. The grayish area around the continent is sea ice, that is, sea that has frozen. In some places, land ice flows off the continent and forms a shelf of ice over the ocean. Can you tell where these areas are? (Hint: This ice is brighter than the sea ice.)

Each summer sea ice melts over an area as large as the USA and then refreezes again in winter.

Also in 1996 we saw a huge iceberg (ice from the land) break away from the Antarctic coast and float away. It is thousands of times bigger than the iceberg that sunk the Titanic. You can see the iceberg drifting in the lower left segment of the movie frame. It is about the size of Rhode Island (100 x 100km), and contains about 240 million gallons of water, so you can calculate how many years it could provide water for your school or town.

In 1998, the Year of the Ocean, I will be studying the movement and drift of the sea ice and icebergs around the Southern Ocean. This will help us to understand the way in which the winds and currents carry the ice around. This is important to our understanding of the global climate.

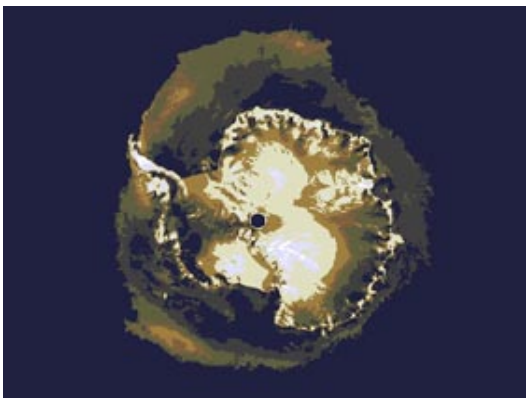
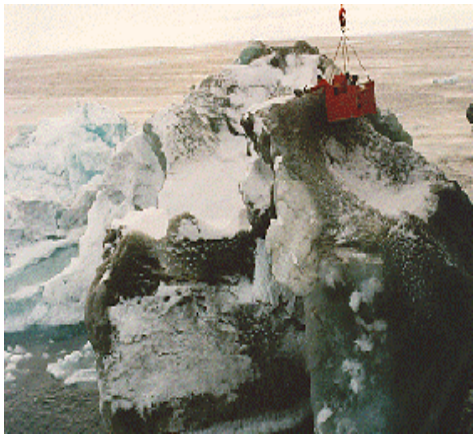


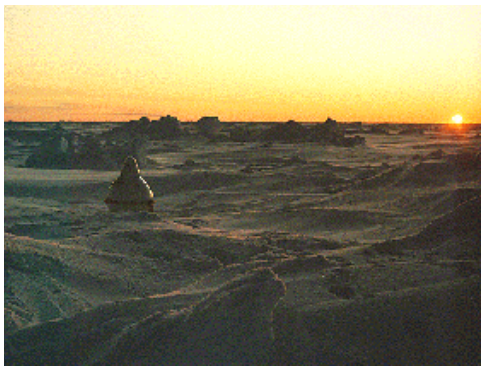
Figure 2. This is another upside-down bird's eye view of Antarctica. The area that does not move is the Antarctic continent and the black hole in the middle is missing data. The different colors are to make the changes in the ice more visible; they are not the real colors! Watch and see how the ice changes. Each summer sea ice melts over an area as large as the USA and then refreezes again in winter.

This is an iceberg near Antarctica; it is about 30m high and only 1/10 of it is above water. It is very big!



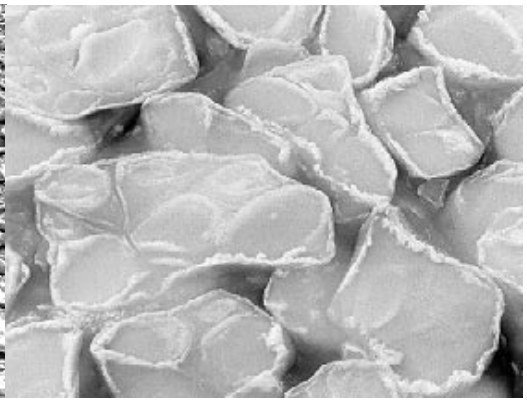
These people are sampling this iceberg. We were very interested in this iceberg because it was so dirty. This dirt came from when the iceberg dragged along the ground and the bottom of the ocean. Since that time it has tipped over so the underside is on top.

Here we are coring into the ice. The drill is at the top and it causes the barrel of the corer to rotate so that the steel "teeth" on the bottom cut into the ice. The corer curns its way into the ice and then when we pull it up it contains a core of ice. We then analyse this for things like salinity, ice crystal structure and bubble content depending on what we are studying. This photograph was taken on the sea ice round the Antarctic. It was very cold and dark most of the time.



This is a buoy that we left on the ice so that the movement of the ice could be tracked by satellite. The sun is just above the horizon and it looks like it should be about dinner time but it was almost the middle of the day. The sun does not rise very high in the sky in the Antarctic winter.

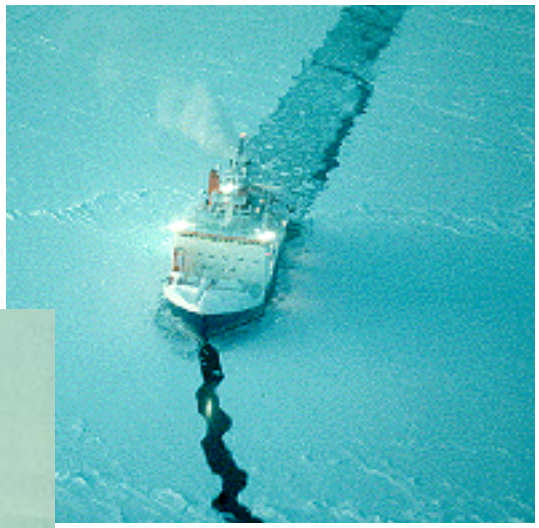
King George Island with icebergs & pack-ice.



A close-up view of pancake ice. You can see how they freeze together and they eventually become ice floes that are 20m across.

Pancake ice. The different types of ice have different names and you can guess how this type of ice got its name! This is ice that is just growing and the edges get smushed up as they bang into each other as the waves bounce them about.

This is the Polarstern taken while we were working on the ice. Some measurements were taken with instruments attached to the ship but many measurements were taken on the ice.



The German ship, the Polarstern, going through sea ice near the Antarctic. The force of the ship is cracking the ice.